It is claimed:

1. A computer-implemented method for retrieving a subset of object data from a persistence layer over a network, wherein the persistence layer is structured at least partially upon an object model definition, comprising the steps of:

   (a) receiving over the network a request from a client computer for object persisted data stored in the persistence layer;

   (b) parsing the request to obtain search criteria and object association data, wherein the object association data identifies at least one association between a pair of objects;

   (c) creating filtering criteria based upon the parsed search criteria and parsed object association data, wherein the object model definition determines how the search criteria and the object association data form the filtering criteria;

   (d) filtering object data from the persistence layer by the filtering criteria in order to generate the object data subset; and

   (e) transmitting the object data subset to the client computer over the network.

2. The method of claim 1 wherein the request includes object criteria nodes and object association role nodes, said method further comprising the steps of:

parsing the request into object criteria nodes and object association role nodes; and

5   creating the filtering criteria based upon the parsed object criteria nodes and the parsed object association role nodes.

3. The method of claim 2 wherein the request alternates between an object criteria node and an object association role node.

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4. The method of claim 2 further comprising the step of:

receiving over the network from the client computer the request formatted in an XPATH specification format.

15 5. The method of claim 2 wherein parsed nodes include the parsed object criteria nodes and the parsed association role nodes.

6. The method of claim 5 further comprising the steps of:

selecting at least one of the parsed nodes to use as persistence layer criteria to

20 search the persistence layer; and

obtaining search results from the persistence layer because of use of the persistence layer criteria; and

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placing the persistence layer search results in an output object working set.

7. The method of claim 6 wherein at least one of the object association role nodes includes the object association data that identifies an association between a pair of objects, said
5   method further comprising the steps of:

retrieving metadata from the object model definition to determine partner association roles for at least one of the parsed object association role nodes;

determining partner objects based upon the partner association roles; and

replacing objects in the output object working set with the determined partner
10   objects.

8. The method of claim 7 further comprising the steps of:

applying criteria from one of the object criteria nodes to the partner objects in the output object working set; and

15   removing from the output object working set partner objects that did not satisfy the applied criteria.

9. The method of claim 7 further comprising the steps of:

applying attribute filtering criteria from one of the object criteria nodes to the
20   partner objects in the output object working set, wherein the attribute filtering criteria includes criteria for filtering objects based upon an object attribute value, wherein a template

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was used as input for the client computer in order to define which attributes are returned by the method for objects of a given class; and

removing from the output object working set partner objects that did not satisfy the applied criteria.

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10. The method of claim 9 further comprising the step of:

further filtering the output object working set by performing steps (f) and (g) for object criteria nodes and object association role nodes that are still to be processed:

(f) applying criteria to the output object working set from an unprocessed object criteria node, and

(g) determining partner objects based upon an unprocessed object association role node for application of criteria from at least one of the object criteria nodes;

transmitting the filtered output object working set as the object data subset to the client computer over the network.

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11. The method of claim 9 further comprising the step of:

encoding the output object working set with tags to indicate associations, attributes, and classes of the objects that are in the output object working set.

20   12. The method of claim 9 further comprising the steps of:

encoding the output object working set with tags to indicate associations, attributes, and classes of objects that are in the output object working set,

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wherein the encoding with tags is performed based upon encoding rules and upon metadata from the object model definition; and

transmitting the encoded output object working set to the client computer over the network.

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13. The method of claim 9 further comprising the steps of:

encoding the output object working set with tags to indicate associations, attributes, and classes of objects that are in the output object working set,

wherein the encoding with tags is performed based upon encoding rules means and upon metadata from the object model definition; and

transmitting the encoded output object working set to the client computer over the network.

14. The method of claim 1 further comprising the step of:

encoding the object data subset with tags to indicate associations, attributes and classes of objects that are in the object data subset,

wherein the encoding with tags is performed based upon encoding rules means and upon metadata from the object model definition.

20   15. The method of claim 1 wherein the persistence layer is an object-oriented database management system.

16. The method of claim 1 wherein the persistence layer is an XML formatted file.

17. The method of claim 1 wherein the network is a network selected from the group consisting of local area networks, intranets, wide area networks, global networks, Internet, and combinations thereof.

18. The method of claim 1 wherein the object model definition is based upon a Unified Modeling Language (UML) format.

19. The method of claim 18 further comprising the steps of:

encoding the object data subset with tags to indicate object associations, object attributes and object classes,

wherein the encoding with tags is performed based upon encoding rules means and upon metadata from the UML object model definition.

20. The method of claim 1 wherein the object model definition includes object class data, object attribute data, and object association data.

21. The method of claim 1 wherein the object model definition is based upon an entity relationship diagram definition.

22.   The method of claim 21 wherein the persistence layer is a relational database management system, said method further comprising the steps of:

creating a structured query language statement to be used as the filtering criteria,

5   wherein the parsed search criteria and the parsed object association data are formatted in accordance with metadata from the entity relationship diagram definition in order to create the structure query language statement; and

using the created structured query language statement to retrieve query results from the relational database management system.

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23.   The method of claim 22 further comprising the steps of:

generating the object data subset by encoding the query results with tags to indicate object associations, object attributes and object classes,

wherein the encoding with tags is performed based upon encoding rules means

15   and upon metadata from the entity relationship diagram definition; and

transmitting the encoded object data subset to the client computer over the network.

24.   The method of claim 23 wherein the encoding is performed using Extensible Markup

20   Language (XML) tags, said method further comprising the step of:

transmitting the encoded object data subset to the client computer in order for the client computer to parse the encoded object data subset by an XML searching mechanism.

25. The method of claim 1 wherein in step (d) the filtering of the object data is performed when the object data is retrieved from the persistence layer.

5   26. The method of claim 1 wherein in step (d) the filtering of the object data is performed when the object data is retrieved from the persistence layer using a portion of the parsed search criteria, and after the object data is retrieved from the persistence layer the object data is further filtered by criteria contained in the other portions of the parsed search criteria.

10   27. The method of claim 1 wherein in step (d) the filtering of the object data is performed after the object data is retrieved from the persistence layer.

28. A computer-implemented apparatus for retrieving a subset of object data over a network, said apparatus comprising:

a server computer connected to the network to receive an object data request

5 from a client computer over the network, wherein the object data request includes search criteria and object association data, wherein the object association data identifies at least one association between a pair of objects;

an object model definition that contains object class metadata;

a persistence layer that is structured at least partially upon the object class

10 metadata to store object data;

a mapping module connected to the object model definition and to the persistence layer, wherein the mapping model creates filtering criteria based upon the search criteria and the object association data, wherein the object model definition determines how the search criteria and the object association data form the filtering criteria;

15 wherein object data from the persistence layer is filtered by the filtering criteria in order to generate the object data subset,

wherein the server computer transmits the object data subset to the client computer over the network.

29. The apparatus of claim 28 wherein the request includes object criteria nodes and object association role nodes, wherein the filtering criteria is created based upon the object criteria nodes and the object association role nodes.

5   30. The apparatus of claim 29 wherein structure of the request alternates between an object criteria node and an object association role node.

31. The apparatus of claim 29 wherein the request has a format of an XPATH specification format.

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32. The apparatus of claim 29 wherein nodes include the object criteria nodes and the association role nodes.

33. The apparatus of claim 32 wherein the mapping module selects at least one of the nodes

15 to use as persistence layer criteria to search the persistence layer, wherein the search results are obtained from the persistence layer because of use of the persistence layer criteria, said apparatus further comprising:

an output object working set to store the persistence layer search results.

20 34. The apparatus of claim 33 wherein at least one of the object association role nodes includes the object association data that identifies an association between a pair of objects,

wherein the metadata from the object model definition determines partner association roles

for at least one of the object association role nodes, said apparatus further comprising:

an association role software function that determines partner objects based

upon the partner association roles,

5   wherein objects in the output object working set are replaced with the

determined partner objects.

35. The apparatus of claim 34 further comprising:

an object criteria software function connected to the object association

10   software function to apply criteria from one of the object criteria nodes to the partner objects

in the output object working set,

wherein at least one of the partner objects is removed from the output object

working that did not satisfy the applied criteria.

15   36. The apparatus of claim 34 further comprising:

means for applying attribute filtering criteria from one of the object criteria

nodes to the partner objects in the output object working set, wherein the attribute filtering

criteria includes criteria for filtering objects based upon an object attribute value; and

means for removing from the output object working set partner objects that

20   did not satisfy the applied criteria.

37. The apparatus of claim 36 wherein the mapping module encodes the output object working set with tags to indicate associations, attributes, and classes of the objects that are in the output object working set.

5   38. The apparatus of claim 36 further comprising:

encoding rules connected to the mapping module that determines how to encode the output object working set with tags to indicate associations, attributes, and classes of objects that are in the output object working set,

wherein the server computer transmits the encoded output object working set

10   to the client computer over the network.

39. The apparatus of claim 28 further comprising:

encoding rules connected to the mapping module that determines how to encode the object data subset with tags to indicate associations, attributes, and classes of

15   objects that are in the output object working set,

wherein the server computer transmits the encoded object data subset to the client computer over the network.

40. The apparatus of claim 28 wherein the persistence layer is an object-oriented database

20   management system.

41. The apparatus of claim 28 wherein the persistence layer is an XML formatted file.

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42. The apparatus of claim 28 wherein the network is a network selected from the group consisting of local area networks, intranets, wide area networks, global networks, Internet, and combinations thereof.

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43. The apparatus of claim 28 wherein the object model definition is based upon a Unified Modeling Language (UML) format.

44. The apparatus of claim 43 further comprising:

10   encoding rules connected to the mapping module that determines how to encode the object data subset with tags to indicate associations, attributes, and classes of objects that are in the output object working set,

          wherein the mapping module encodes the object data subset in a manner that is consistent with the encoding rules and the metadata from the UML object model definition,

15   wherein the server computer transmits the encoded the object data subset to the client computer over the network.

45. The apparatus of claim 28 wherein the object model definition includes object class data, object attribute data, and object association data.

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46. The apparatus of claim 28 wherein the object model definition is based upon an entity relationship diagram definition.